

QB1

Big Oh (simple)

Do NOT write on this test. Record all answers on the bubble sheet. **Closed book. No notes.** Work strictly from memory. No time limit. **No calculators. Scratch paper okay.**

- 1/2p. Give a tight big-oh $\Theta()$ bound on the running time $T(n)$ of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.
(A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
    int n = atoi(argv[1]);
    if ( simpleCompare ) {
        e = n; do {
            if ( simpleCompare ) {
                simpleStatement;
            } else {
                simpleStatement;
            }
            e--; } while ( e > 1 );
    } else {
        simpleStatement;
    }
    return 0; }
```

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- 2/2p. Give a tight big-oh $\Theta()$ bound on the running time $T(n)$ of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.
(A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
    int n = atoi(argv[1]);
    c = 1; do {
        e = n; do {
            if ( simpleCompare ) {
                if ( simpleCompare ) {
                    if ( simpleCompare ) {
                        simpleStatement;
                    }
                }
            } else {
                if ( simpleCompare ) {
                    simpleStatement;
                } else {
                    simpleStatement;
                }
            }
            e--; } while ( e > 1 );
        c += 1; } while ( c < n );
    return 0; }
```

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3/2p. Give a tight big-oh $\Theta()$ bound on the running time $T(n)$ of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.

- (A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
    int n = atoi(argv[1]);
    if ( simpleCompare ) {
        b = n; while ( b > 1 ) {
            for ( g = n ; g > 1 ; g-- ) {
                d = n; while ( d > 1 ) {
                    if ( simpleCompare ) {
                        if ( simpleCompare ) {
                            for ( j = n ; j > 1 ; j -= 10 ) {
                                simpleStatement;
                            }
                        }
                    } else {
                        if ( simpleCompare ) {
                            simpleStatement;
                        } else {
                            simpleStatement;
                        }
                    }
                }
                d -= 5; }
            }
        b--; }
    } else {
        e = n; do {
            if ( simpleCompare ) {
                a = 1; while ( a < n ) {
                    i = 1; do {
                        if ( simpleCompare ) {
                            simpleStatement;
                        }
                    }
                    i++; } while ( i < n );
                a++; }
            }
        e--; } while ( e > 1 );
    }
    return 0; }
```

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4/2p. Give a tight big-oh $\Theta()$ bound on the running time $T(n)$ of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.

- (A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
    int n = atoi(argv[1]);
    h = 1; while ( h < n ) {
        if ( simpleCompare ) {
            for ( b = 1 ; b < n ; b += 3 ) {
                f = n; while ( f > 1 ) {
                    if ( simpleCompare ) {
                        if ( simpleCompare ) {
                            k = n; while ( k > 1 ) {
                                j = 1; while ( j < n ) {
                                    if ( simpleCompare ) {
                                        simpleStatement;
                                    }
                                }
                                j++; }
                                k--; }
                            } else {
                                if ( simpleCompare ) {
                                    simpleStatement;
                                } else {
                                    simpleStatement;
                                }
                            }
                        }
                    } else {
                        a = n; do {
                            if ( simpleCompare ) {
                                if ( simpleCompare ) {
                                    simpleStatement;
                                } else {
                                    simpleStatement;
                                }
                            }
                        }
                        a -= 2; } while ( a > 1 );
                    }
                f -= 10; }
            }
        h += 5; }
    return 0; }
```

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5/2p. Give a tight big-oh $\Theta()$ bound on the running time $T(n)$ of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.

- (A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
    int n = atoi(argv[1]);
    g = n; do {
        if ( simpleCompare ) {
            j = 1; do {
                for ( e = n ; e > 1 ; e -= 5 ) {
                    if ( simpleCompare ) {
                        h = n; do {
                            if ( simpleCompare ) {
                                if ( simpleCompare ) {
                                    i = 1; while ( i < n ) {
                                        if ( simpleCompare ) {
                                            simpleStatement;
                                        }
                                        i += 5; }
                                } else {
                                    simpleStatement;
                                }
                            }
                            h -= 2; } while ( h > 1 );
                        } else {
                            if ( simpleCompare ) {
                                if ( simpleCompare ) {
                                    for ( d = 1 ; d < n ; d += 2 ) {
                                        simpleStatement;
                                    }
                                } else {
                                    simpleStatement;
                                }
                            } else {
                                simpleStatement;
                            }
                        }
                    }
                } while ( j < n );
            }
            g -= 10; } while ( g > 1 );
    return 0; }
```

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Bro Colton

CS 201 Big Oh (simple)

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Total points 10.

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Answer Key (points per line)

1 (2).	I (n)
2 (2).	H (n^2)
3 (2).	F (n^4)
4 (2).	E (n^5)
5 (2).	E (n^5)

Total points 10.